

As the result of a memorial addressed to them by the demonstrators in the various departments of Natural Science, the Hebdomadal Council have appointed a committee, consisting of Mr. T. Raleigh, of All Souls, and Mr. T. H. Grose, of Queen's College, to inquire into the position and status of the demonstrators at the museum.

CAMBRIDGE.—Dr. Forsyth has been appointed chairman of the Examiners for the Mathematical Tripos, Part II., and Mr. Welsh, of Jesus College, for Part I.

Prof. Ramsay, of University College, London, has been elected Examiner in Chemistry for the Natural Sciences Tripos.

At St. John's College, Mr. E. W. Macbride, Hutchinson Research Student, and University Demonstrator in Animal Morphology, has been elected to a Fellowship. Mr. Macbride took a first class in both parts of the Natural Sciences Tripos (zoology and botany) in 1890-91, and is the author of various morphological papers based on researches conducted in Cambridge and at the Zoological Station at Naples. He has been President of the Union Society, and is well known as a vigorous debater. At the competition for Fellowships on this occasion there were no less than seven candidates in Natural Science, who had all taken first class honours in the Tripos as students of St. John's.

SCIENTIFIC SERIALS.

Wiedemann's *Annalen der Physik und Chemie*, No. 10.—On air vibrations, by A. Raps. The changes of density at the nodes of open and closed organ pipes were recorded by allowing a beam of strong white light to fall upon the mirror of a Jamin interference refractor. One of the reflected beams was sent through a pipe at the node, the other through a box containing undisturbed air. After reunion by the second mirror, these two beams gave rise to interference fringes, which were displaced during the changes of density accompanying the sound of the pipe. A section across these fringes, consisting of bright and dark points, was received upon a revolving drum carrying sensitive paper, and the oscillation of the points gave rise to a series of curves representing the sound vibrations with very fair accuracy. A series of eighty-eight photographs are reproduced, which give valuable hints concerning the structure of the various notes, and also some vowels and consonants produced in the open air.—Luminous phenomena in electrode-less vacuum tubes under the influence of rapidly alternating electric fields, by H. Ebert and E. Wiedemann. This paper, a sequel to the general investigation published in No. 9, deals with the details of the phenomena observed between the condenser plates of a Lecher wire system in the case of spheres, cylinders of various lengths, coaxial double cylinders, and glass parallelepipeds with plane ends.—Heat of dissociation in electro-chemical theory, by H. Ebert. Calculations based upon heat of dissociation and electrolytic work show that the forces of chemical affinity are chiefly of an electric nature, that the forces due to "valency-charges" are the most powerful of any atomic forces, and that any additional chemical forces are, in comparison, infinitesimal.—Equipotential lines and magnetic lines of force, by E. von Lommel. Some further photographic tracings of these lines are given, and their bearing upon the Hall effect is discussed.—Objective representation of interference phenomena in spectrum colours, by the same author. Simple arrangements are described for exhibiting Newton's rings, gypsum fringes, convergent polarised light phenomena, and fringes produced by the rotation of the plane of polarisation in quartz prisms, upon a screen. For Newton's rings the light from the heliostat is reflected by a colour plate, and falls upon a lens which produces an image of the sun at its focus. By placing a slit at this focus and a prism between slit and lens, the rings in all the spectrum colours may be thrown upon the screen by shifting the slit.—Papers by Kayser and Kunge, P. Czermak, and R. J. Holland have already been mentioned.

THE pages of the *Botanical Gazette* for September contain but little except reports of the proceedings of the Botanical Section of the Madison meeting of the American Association for the Advancement of Science, of the Madison meeting of the Botanical Club, and of the Madison Botanical Congress. That for October contains several important papers:—On the fructification of *Juniperus*, by Mr. J. C. Jack, who states that in America the fruit of the English species of juniper does not

mature until the autumn of the third year after blossoming; on the development of the embryo-sac of *Acer rubrum*, by Mr. D. E. Mottier; on the achenial hairs of *Compositæ*, by Miss M. A. Nichols; and on the bacterial flora of the Atlantic Ocean in the vicinity of Woods Holl, Mass., by Mr. H. L. Russell. The results obtained by the author accord in a general way with those previously made in the Mediterranean. While the water and underlying sea-flow are filled with bacterial life, they are by no means in an entirely quiescent condition. Both water and mud are peopled with micro-organisms which are undergoing their cycle of development here as elsewhere.

THE Nos. of the *Journal of Botany* for October and November are almost entirely occupied by papers on local and descriptive botany, including the completion of Mr. E. G. Baker's synopsis of Geneva and species of *Malva*, and a sketch of the botany of Ireland, by Mr. A. G. Moore.

THE summer number of the *Jahrbuch* (Austrian Geological Survey) contains contributions by Drs. Emil Tietze, von Wöhrmann, Bittner, Skuphos, and others. Dr. Emil Tietze writes on the "Geology of the Ostrau District." Great hopes were raised in this neighbourhood by the discovery of coal near Wagstadt, in the Upper Oder valley, but Dr. Tietze informs us that the coal occurs only locally and in mere fragments. With regard to the age of the Ostrau beds, he argues that they should be grouped with the upper and not with the lower carboniferous series. They rest unconformably on the Culm grits and shales and are conformably succeeded by the Schatzlar beds, a deposit closely resembling the Ostrau beds in general character. Another paper by Dr. Tietze discusses the prospects of the salt industry in East Galicia.—Baron v. Wöhrmann contributes an article on the "Systematic Position of the Trigonidæ and the Descent of the Nayadidæ." He shows that both the Trigonidæ and the Nayadidæ have true heterodont hinges, and that therefore the classification into schizodont and heterodont bivalves suggested by Neumayr cannot be carried out. Taking the fresh-water bivalve *Unio* as type-form of the Nayadidæ, v. Wöhrmann traces the phylogenetic relationship of this family with the genus *Trigonodus* (Up. Triassic shore deposits), and through *Trigonodus* with the ancient ancestral type, *Myophoria* (Devonian to Rhætic).—Dr. Theodor Skuphos completes his survey of the Partnach beds in the Northern Alps. He found in the Vorarlberg deposits of this age a new fossil Saurian, which he names *Partanosaurus Zitteli*. Dr. Skuphos thinks it probable that this Saurian is identical with certain remains found in extra-alpine deposits of Upper Muschelkalk age in Würtemberg.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, October 27.—Prof. J. Perry, F.R.S., vice-president, in the chair.—Mr. E. C. Rimington read a paper "On the Behaviour of an Air-Core Transformer when the Frequency is Below a certain Critical Value." Taking the ordinary differential equations for two circuits having self and mutual induction, and assuming sinusoidal E.M.F.'s and constant coefficients, the author shows that although the difference of phase between the primary P.D. and primary current is always diminished on closing the secondary circuit, yet under certain circumstances this closing increases the impedance of the primary. With constant P.D. this means that closing the secondary decreases the primary current, a phenomenon not usually observed. The critical conditions necessary for increased impedance are fully worked out in the paper, as well as those under which this increase becomes a maximum. In the case of two identical coils with no magnetic leakage, the critical value of α ($\alpha = \frac{p}{r_1} L$ where $p = 2\pi$ times the frequency, L the inductance of the primary, and r_1 its resistance) is $\sqrt{2}$, whilst that to give maximum impedance is $\frac{1}{\sqrt{2}}$. The maximum increase possible is $15\frac{1}{2}$ per cent. The corresponding values are given for various amounts of magnetic leakage in tabular form, and curves were exhibited at the meeting showing how the impedance, current, power, and magnetising effect vary for different values of α . To test his conclusions the author made experiments on two coils close together, the observed increase in impedance amounting to 3.2 per cent. In addition to the analytical

investigation, the subject is treated geometrically at considerable length. Prof. Minchin showed that the impedances might be represented by two hyperbolas, having p^2 as abscissæ and the squares of the impedances as ordinates. These could be readily constructed from the data given. A line representing the primary inductance drawn on the same diagram intersects one hyperbola, showing that the impedance has always a maximum value. By a simple construction the phase angle between the primary and secondary currents could be determined for any given conditions. Dr. Sumpner observed that increased impedance on closing the secondary necessarily meant a decrease in the lag of the primary current behind the primary P.D. Mr. Blakesley was pleased to see the geometrical method of such service, and thought it much simpler than the analytical one. The reason why increased impedance on closing the secondary of ordinary transformers had not been noticed was because their lag angles were very large. In a figure published some years ago to represent the actions of transformers, the angles he had chosen were such as would make the primary impedance increase on closing the secondary. Giving an expression connecting the primary currents on open and closed secondary respectively, he now showed that to get increased impedance, the sum of the lag angles in primary and secondary must exceed 90° . To get large power in the secondary the primary lag should be nearly 90° , and the secondary about 45° . He also pointed out that some of the figures in the paper might be simplified considerably. Prof. Perry said he had long had the impression that if a sufficiently small current were taken from the secondary, increased impedance would be observable in all cases, and he quoted some numbers he had given in the *Phil. Mag.* for 1891, showing a decided increase. Mr. Rimington, in reply, said he was not aware that the effect he had now brought forward had been observed previously. The result was completely worked out analytically before using geometrical methods.—Mr. W. B. Croft showed "Two lecture-room experiments." One, on "The Rings and Brushes in Crystals," was performed by very simple apparatus in two ways. In the first, a bundle of glass plates was used as a polariser, and a Nicol prism as analyser. When a Nicol could not be conveniently obtained, a glass plate could be used as a reflecting analyser. For a convergent system two glass card-counters were used, the crystal being placed between them. Very good results were produced by this simple apparatus. In the second arrangement the crystal was placed on the eye-piece of a microscope (whose objective was removed), and covered by a tourmaline. On reflecting light up the tube by means of a piece of glass held at the proper angle excellent results were obtained. Another experiment, on "Electric Radiation in Copper Filings," was similar to those described by Dr. Dawson Turner at the Edinburgh meeting of the British Association. A battery, galvanometer, and glass tube containing copper filings were joined in series. Under ordinary circumstances no current passed, but immediately an electric spark was produced by an electric machine many feet away, the galvanometer was violently deflected, and remained so until the tube was tapped. On trying different materials, aluminium and copper seemed about equal, but iron not so good; carbon allowed the current to pass always. Prof. Minchin said the phenomena were strikingly like those exhibited by his "impulsion cells," for the moment a spark passed, even at a distance of 130 feet, they became sensitive to light. Very minute sparks were capable of producing the change, but by adding capacity to the sparking circuit the effect could be greatly modified. Replying to a question from Mr. Rimington, he said the change was due to electromagnetic vibrations, and not to light emitted by the sparks. Mr. Blakesley inquired if lengthening the sparks produced greater effect on the copper filings. Mr. Lucas asked if the resistance of a tube ever became infinite again if left for a long time. In reply, Mr. Croft said the current sometimes passed before the spark actually occurred between the knobs. He had not left tubes for very long, and had not found the resistance reappear without tapping.

Royal Microscopical Society, October 18.—A. D. Michael, President, in the chair.—Mr. J. G. Grenfell described some marine diatoms, recently found at Plymouth, belonging to the genera *Melosira* and *Surirella*, which were of interest owing to the presence of pseudopodia. Mr. A. W. Bennett objected to the term pseudopodia being applied to these processes unless it could be shown that they were actual prolongations of the internal protoplasm. Mr. T. Comber said that

Prof. Grunow was of the opinion that the processes were spines.—Mr. E. M. Nelson exhibited and described a new model of a microscope by Messrs. Watson.—Mr. F. Chapman read Part V. of his paper "On the Foraminifera of the Gault of Folkestone."—Prof. Bell gave a *résumé* of a paper by Dr. R. L. Maddox, "On Progressive Phases of *Spirillum volutans*." The author had traced the development of this organism, and had discovered some points which appeared to be entirely new in the history of bacteria.

PARIS.

Academy of Sciences, October 30.—M. de Lacaze-Duthiers in the chair.—The grape-vine harvest of 1893 and the produce of the Camargue, by M. Chambrelent. In spite of the severe drought the vineyards of the Gironde have given the richest yield in the century. This has been due to a unique combination of favourable circumstances during their development. The facility with which they withstood the drought may be attributed to the fact that vine-leaves have a peculiar power of absorbing dew, which has been very abundant. This year has also witnessed the earliest date of harvest known in the century. In 1822 it took place on August 31, whilst this year it was eight days earlier. The quality of the harvest, which improves with the quantity, may be expected to prove very good.—On the application of sound vibrations to the analysis of mixtures of two gases of different densities, by M. E. Hardy. The apparatus, called the formenophone, consists of two organ pipes, one of which is filled with pure air, the other containing the mixture of gases to be analysed. The pipes are of the same dimensions, and give the same note when blown under the same circumstances. If one of them is filled with air containing 1 per cent. of formene, the unison is disturbed and one beat is heard every three seconds. With 2 per cent. there are three beats in two seconds, with 3 per cent. two beats per second, and so on. Similar results may be obtained with carbonic acid as an impurity. The figures given apply to pipes sounding C_4 . For mixtures whose density closely approaches that of air C_5 is more suitable. Each determination is finished in a few seconds. The apparatus is well suited to the determination of the amount of fire-damp in mines.—Observations of Comet Brooks (1893, Oct. 16) made at the Algiers Observatory by MM. Rambaud and Sy.—Observations of the sun made at the Lyon Observatory (Brunner equatorial) during the first half of 1893, by M. J. Guillaume. This is a summary of the observations made of sunspots and faculæ, with particulars of their positions and areas.—On a new theorem of mechanics, by M. N. Seiliger.—On carboxyl derivatives of dimethylaniline (dimethylamidobenzoic acid) by M. Charles Lauth.—On the baking temperature of bread, by M. Aimé Girard. Numerous experiments have proved that $101^\circ C.$ is the normal temperature in the interior of bread and biscuit during baking if the product is to be satisfactory.—Study of the reproduction of wasps, by M. Paul Marchal. Careful observations of the physiological function of the workers, mis-called neuters, of a common wasps' nest have proved parthenogenetic reproduction by the workers, without the cooperation of the males, and the exclusively male sex of the individuals thus produced. It appears that there is a division of labour between the queen, who produces mainly females and workers, and the workers themselves, which are only capable of producing males.—On the localisation of the active principles in *Tropæolum*, by M. Léon Guignard. In the *Tropæolum* family, all the organs enclose myrosine, localised in cells distinct from those which contain the glucoside, which it decomposes to produce the essence. The latter does not pre-exist in the tissues and cannot be formed without the intervention of the ferment. The family shows in this respect a complete analogy with the Crucifers and Capparidæ.—On the existence of gismondine in the geodes of a basalt of the environs of Saint-Agrève (Ardèche), by M. Ferdinand Gonnard.—Fractures of the coal measures of southern Chili, by M. A. E. Noguès. In the lignite region extending from the Bay of Talcahuano to Lebu, there is found a large fault running from east to west, which it is proposed to call the Lebu-fault. To the north of this fault the strata incline towards the west; to the south, they incline towards the east. Between San Rosendo and Lebu may be traced a system of parallel north-to-south faults which have affected the older strata; a system of parallel east-to-west faults, which have dislocated the arenaceous lignite territory; and a system of secondary faults, which have brought about changes of level in this same formation.—General

characters of the *bogheads* produced by Algæ, by MM. C. E. Bertrand and B. Renault. A study of the *boghead* of Autun, the kerosene shale of Australia, and the brown torbanite of Scotland show that these deposits are due to the thalli of a single species of alga, that of Autun containing *Pila vibractensis*, the kerosene shale Reinschia australis, and the Torbanite another *Pila*.

BERLIN.

Meteorological Society, October 10.—Prof. von Bezold, President, in the chair.—Prof. Hellmann spoke on the frequency of halo phenomena, after having first described their typical features and their causation by reflection and refraction from hexagonal ice-prisms. From observations at Upsala extending over seven years he had ascertained that the 22° halo is most frequently observed, then mock suns and moons, then the 46° halo, and least frequently the vertical pillars of light. On the whole the phenomena are five times more frequent in connection with the sun than with the moon. During the course of a year the phenomena follow a regular course; solar-halos are at a maximum in May and a minimum in December, whereas lunar-halos are at a maximum in December and a minimum in May. If snow-crystals were equally plentiful in the air at all periods of the year, then solar-halos would be most frequently seen in June, at the time when the sun is above the horizon for the longest period on each day. But inasmuch as there are fewer snow-crystals in the air in the summer, the maximum is put back to May. The maximum for lunar-halos occurs when the nights are longest and there are most snow-crystals in the air. Statistics from the polar stations for 1882-83 show that only solar phenomena occur during the period of midnight sun, and only lunar phenomena during the polar night, their frequency being solely dependent on the occurrence of clouds. An account was given of a stroke of lightning in Heligoland which had smitten two persons near the railroad, killing one and stunning the other. Photographs were exhibited of the latter as showing the characteristic marks on the arm, chest, abdomen, and legs. After a member of the Society had suggested a new method of estimating clouds—which, however, requires further working out and testing—the President drew attention to wave-clouds as described by Von Helmholtz in his most recent theoretical work on the dynamics of the atmosphere. They occur when two layers of air travelling with different velocities pass one over the other, in which case waves are formed and clouds at the junction of the layers. These clouds are then drawn out into long strips, formerly called polar-bands. They occur not only in the layers of cirrus clouds, but also at lower levels. A wish was expressed that these clouds might be photographed.

Physical Society, October 20.—Prof. Kundt, President, in the chair.—Dr. Raps gave an account of his work on the photography of aerial vibrations. The method is based on the use of a Jamin's refractometer, which produces interference phenomena by means of reflection and refraction of a ray of light at the surfaces of two parallel glass plates. When the air between the two plates is transmitting waves of condensation and rarefaction, the interference bands are displaced, and if they fall on a slit behind which a sensitized paper is kept in motion on a drum, the waves of aerial vibration may be recorded. The experiments were first made on a closed organ-pipe, near whose upper end were two openings facing each other but closed with glass. Through these the two rays of light passed before they were made to interfere. When the pipe was gently blown, sine curves alone were obtained, corresponding to the fundamental note of the pipe. As the pressure was increased, the overtones became more and more prominent, until at last they alone determined the shape of the curve. Further experiments were made with closed reed pipes, after it had been ascertained that the tongue of the reed vibrates like a pendulum. The phenomena were the same as in the first case. Experiments with open pipes were found to be much more difficult, but even in this case good photographs of the vibrations were obtained. Dr. Raps had also been able, by the same method, to photograph the vibrations resulting from the singing of vowels, and to show that definite harmonic overtones are characteristic of each vowel. Similarly photographs had been taken of the vibrations due to a hunting-horn. Dr. Raps further exhibited an Ampère apparatus for lecture purposes, in which the current was supplied by means of metallic instead of mercury contacts.

Physiological Society, October 27.—Prof. du Bois Reymond, President, in the chair.—Dr. Lewin gave an account

of researches on the physiology of the ureter, carried out in conjunction with Dr. Goldschmidt. These had shown that the entry of urine into the upper end of the ureter is due to pressure exerted by the kidney; that the peristaltic waves of contraction of the ureter either pass right down to the bladder, or occasionally stop short in their course along the ureter; that the point of entry of the ureter into the bladder is possessed of a sphincter, but that notwithstanding this it is occasionally possible for fluid to be driven back out of the bladder into the ureter.—Prof. Senator spoke briefly about the experiments he made some seventeen years ago, on the results of varnishing the skin in men, defending their validity, and the conclusion that varnishing does not affect the health, against objections which had recently been brought forward.—Dr. Cohnstein described experiments on the influence of diffusive processes on transudation. When salt solutions were allowed to flow under a constant pressure through a ureter or jugular vein surrounded by fluid, it was found that the amount of salt passing through into the outer fluid increased with the pressure on the latter. Similarly a solution of egg-albumen diffused more copiously into an external fluid than could be observed when it was forced by filtration into a space filled with air; but the amount of albumen which passed through was independent of the external pressure. This diffusion must play a very important part in the transudation of fluid from the blood-vessels, and in the tissue-cells of the living organism, and may suffice to explain many as yet incomprehensible phenomena.

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